PIERS 2023 Prague

PhotonIcs & Electromagnetics Research Symposium

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Program

July 3–6, 2023

Prague, CZECH REPUBLIC

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15:30 **Coffee Break**

Session 2P12b
Advanced RF and Microwave Technologies for New Mobility Applications

Tuesday PM, July 4, 2023

Room 12 - South Room 224

Organized by Sang-Min Han

Chaired by Sang-Min Han, Yongchae Jeong

16:00 Miniaturized Four Port MIMO Antenna for URLLC and Virtual MIMO Applications
Osama Aziz (*Ghulam Ishaq Khan Institute of Engineering Sciences and Technology*); *MuhibUr Rahman* (*Polytechnique Montreal*);

16:15 Utilizing Transmission Lines for Efficient Energy Harvesting in 5G Networks
Maryam Eshaghi (*University of Windsor*); *Rashid Rashidzadeh* (*University of Windsor*);

16:30 The Method of De-embedding without the TRL Calibration Board
Minseong Kim (*Soonchunhyang University*); *Sohui Kim* (*Soonchunhyang University*); *Jiwon Kim* (*Soonchunhyang University*); *Heaseong Cha* (*SAWNICS Co., Ltd.*); *Soon Hong Ahn* (*SAWNICS Co., Ltd.*); *Youna Jang* (*Soonchunhyang University*); *Dal Ahn* (*Soonchunhyang University*);

16:45 Design of Compact and High Selective RF Front-end Module for Low-band 5G and IoT Applications
Trong-Hieu Le (*Electric Power University*); *Manh-Cuong Ho* (*Electric Power University*); *Le-Cuong Nguyen* (*Electric Power University*);

17:00 Compact Microwave Device Designs with DGSs for Mobility Applications
Sang-Min Han (*Soonchunhyang University*); *Won-Sang Yoon* (*Hoseo University*); *Jongsik Lim* (*Sooncheonhyang University*); *Dal Ahn* (*Soonchunhyang University*);

17:15 Deep Reinforcement Learning-based Auto-tuning Algorithm for Cavity Filters
Daniel Poul Mtowe (*Soonchunhyang University*); *Seong-Ho Son* (*Soonchunhyang University*); *Dal Ahn* (*Soonchunhyang University*); *Dong Min Kim* (*Soonchunhyang University*);

17:30 Magnetless Nonreciprocal Bandpass Filter Using Time-modulated Resonators
Girdhari Chaudhary (*Jeonbuk National University*); *Phanam Pech* (*Jeonbuk National University*); *Samdy Saron* (*Jeonbuk National University*); *Yongchae Jeong* (*Jeonbuk National University*);

17:45 Unequal Termination Impedances Bandpass Filter Based on Different-mode Substrate Integrated Waveguide Cavity
Phanam Pech (*Jeonbuk National University*); *Samdy Saron* (*Jeonbuk National University*); *Girdhari Chaudhary* (*Jeonbuk National University*); *Yongchae Jeong* (*Jeonbuk National University*);

18:00 A Design of Multilayer Interdigital Bandpass Filter Using Low-temperature Co-fired Ceramic (LTCC) Technology
Sohui Kim (*Soonchunhyang University*); *Minseong Kim* (*Soonchunhyang University*); *Dae-Ung Lee* (*Huba Research Institute*); *Hyung-Sik Park* (*Huba Research Institute*); *Youna Jang* (*Soonchunhyang University*); *Dal Ahn* (*Soonchunhyang University*);

18:15 A Size-reduced CPW Ring Hybrid Coupler Using a Phase Converting Structure
Jongsik Lim (*Sooncheonhyang University*); *Donghun Kang* (*Soonchunhyang University*); *Kyungmin Park* (*Soonchunhyang University*); *Gil-Young Lee* (*Air Force Academy*); *Sang-Min Han* (*Soonchunhyang University*); *Dal Ahn* (*Soonchunhyang University*); *Yongchae Jeong* (*Jeonbuk National University*);

Session 2P13
Poster Session 3

Tuesday PM, July 4, 2023

14:00 PM - 18:00 PM

Room 13 - Congress Hall Foyer 2

1 Glare Points in Laser Flow Cytometry
Alexander Putz (*Physikalisch-Technische Bundesanstalt*); *M. Hussels* (*Physikalisch-Technische Bundesanstalt*); *Jonas Gienger* (*Physikalisch-Technische Bundesanstalt*);

2 A Single-layer Polarization-insensitive Broadband Absorber for X-band Applications
Cheng-Yen Chung (*Yuan Ze University*); *Cheng-Nan Chiu* (*Yuan Ze University*); *Ming-Kun Hsieh* (*Bureau of Standards, Metrology and Inspection, Ministry of Economic Affairs*); *Yuan-Fu Ku* (*Taiwan Testing and Certification Center*);

3 Utilization of Transmission Phase Shift Method for Characterizing Properties of Material Encapsulated by Rectangular Waveguide
Sulistyaningsih (*Institut Teknologi Bandung*); *Zulfi* (*Institut Teknologi Bandung*); *Umar Khayam* (*Institut Teknologi Bandung*); *Achmad Munir* (*Institut Teknologi Bandung*);

Unequal Termination Impedances Bandpass Filter Based on Different-mode Substrate Integrated Waveguide Cavity

Phanam Pech[1], **Samdy Saron**[1], **Girdhari Chaudhary**[2], **and Yongchae Jeong**[1]

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[2]JIANT-IT Human Resource Development Center, Jeonbuk National University, Republic of Korea

Abstract— Unequal termination impedance (UTI) bandpass filter (BPF) plays an essential role in modern communication systems. The UTI BPF can be operated as the matching network in communication systems. The substrate integrated waveguide (SIW) BPF has attracted much attentions due to its high power-handling capability, Q-factor, low cost, low insertion loss, and ease of fabrication. In [1, 2], the co-design of filters with amplifiers were presented. The BPF matching networks were realized from full-mode (FM) SIW cavities. By using the co-design methods, the overall circuit size was much smaller than the circuit size of typical BPFs cascaded with amplifiers. However, the FM SIW cavity still occupies a large area, especially in microwave frequency range.

In this paper, a compact-size BPF with UTI based on different-mode SIW cavities is presented. The proposed compact-size UTI BPF is realized using quarter-mode (QM) and one-eight-mode (OEM) SIW cavities on a single-layer printed circuit board. The QM and OEM SIW cavities feature two open sides that do not form a perfect magnetic wall, causing the magnetic field to leak, which leads to a lower Q-factor than that of the FM SIW cavity. However, the strong coupling coefficient between different-mode SIW cavities can be easily obtained. Therefore, the different-mode SIW cavities can be used in broadband BPFs which the FM SIW cavity cannot easily provide. The proposed compact-size UTI SIW BPF is designed with the fundamental frequency, resonator order, and fractional bandwidth of 8 GHz, 4, and 12%, respectively. The proposed circuit is designed with termination impedances of 20 Ω to 50 Ω. The first resonator is realized using OEM SIW cavity. The second, third, and fourth resonators are realized using QM SIW cavities. The transmission zero is occurred in the stopband and demonstrates improved frequency selectivity. By using QM and OEM SIW cavities, the size of the proposed SIW BPF is much smaller than the BPF realized with only the FM SIW cavity.

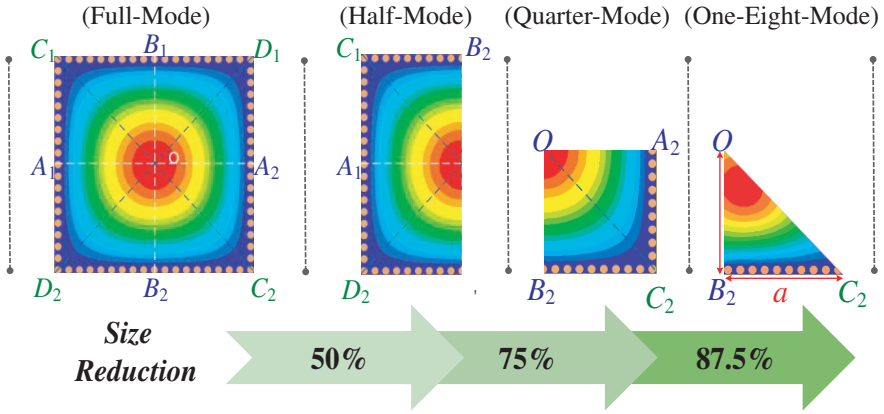

Figure 1: .Comparison of structures and sizes of different-mode SIW cavities.

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REFERENCES

1. Pech, P., P. Kim, and Y. Jeong, "Microwave amplifier with substrate integrated waveguide bandpass filter matching network," *IEEE Microw. Wireless Compon. Lett.*, Vol. 31, No. 4, 401–404, Apr. 2021.
2. Pech, P., S. Saron, G. Chaudhary, and Y. Jeong, "X-band filter-amplifier for radio frequency front-end receiver systems," *Proc. IEEE Asia-Pacific Microw. Conf.*, 698–700, Nov. 2022.